Solomon Practice Paper

Pure Mathematics 1F

Time allowed: 90 **minutes**

Centre: www.CasperYC.club

Name:

Teacher:

Question	Points	Score
1	5	
2	6	
3	6	
4	9	
5	11	
6	12	
7	12	
8	14	
Total:	75	

How I can achieve better:

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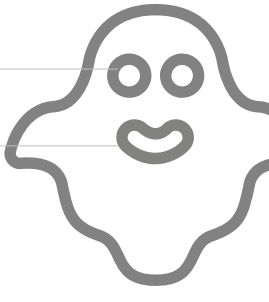
Last updated: July 14, 2025

1. Solve for x in the interval $0 \leq x \leq 360°$: [5]

$$\sqrt{3} - 2\cos(x + 45) = 0.$$



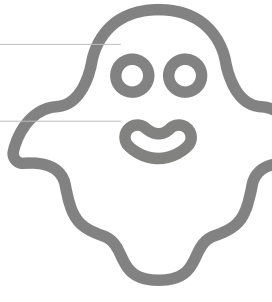
2.

$$\mathrm{f}(x) \equiv 3 + 21x + 9x^2 - x^3.$$

(a) Find $\mathrm{f}'(x)$. [2]

(b) Find the set of values of x for which $\mathrm{f}(x)$ is decreasing. [4]

Total: 6

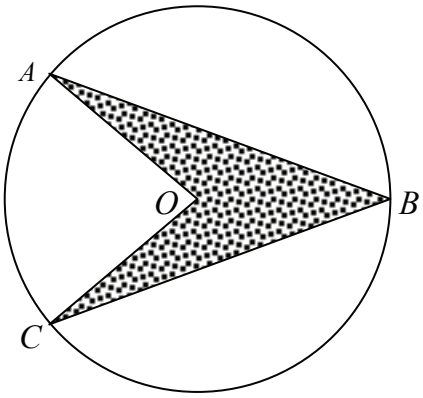


3. (a) Expand $(1-5x)(x^3+x)$ in ascending powers of x. [2]

   (b) Hence show that when $x=\sqrt{3}$, the value of $(1-5x)(x^3+x)$ can be written in the form $a\sqrt{3}+b$ where a and b are integers to be found. [4]

Total: 6

4. Figure shows the badge design for a new model of car.



The design consists of an arrowhead in a circle. O is the centre of the circle and A, B and C lie on the circumference of the circle. The arrowhead is symmetrical about the line through OB.

Given that the radius of the circle is 7.2 cm and $\angle AOC = 84°$,

(a) find the size of $\angle AOB$, [2]

(b) calculate the area of triangle AOB, correct to 2 decimal places, [3]

(c) calculate the area of the arrowhead as a percentage of the area of the circle. [4]

Total: 9

5. (a) By completing the square show that $ax^2 + bx + c$ can be written as [3]

$$a\left(x + \frac{b}{2a}\right)^2 + c - \frac{b^2}{4a}.$$

(b) Hence prove that the solutions of the equation $ax^2 + bx + c = 0$ are given by [4]

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

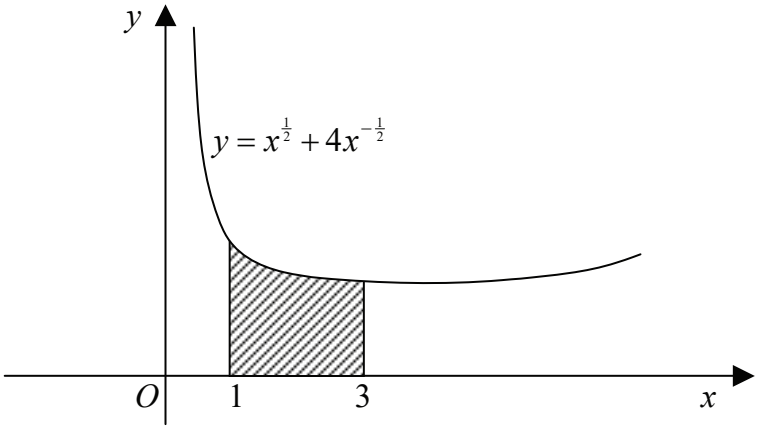
(c) Solve the equation [4]

$$x(2x - 3) = 1 + x$$

giving your answers correct to 3 significant figures.

Total: 11

6. Figure shows the part of the curve with equation $y = x^{\frac{1}{2}} + 4x^{-\frac{1}{2}}$.



(a) Find the coordinates of the minimum point of the curve. [6]

(b) Find the area of the shaded region enclosed by the curve, the x-axis and the ordinates $x = 1$ and $x = 3$, giving your answer as an exact value. [6]

Total: 12

7. The second and fifth terms of an arithmetic series are 213 and 171 respectively.

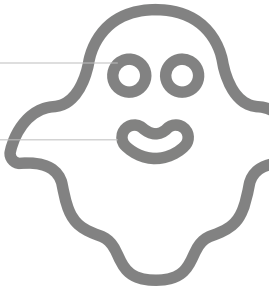
   (a) Find the first term and the common difference of the series. [4]

   (b) Find and simplify an expression for the nth term of the series in terms of n. [2]

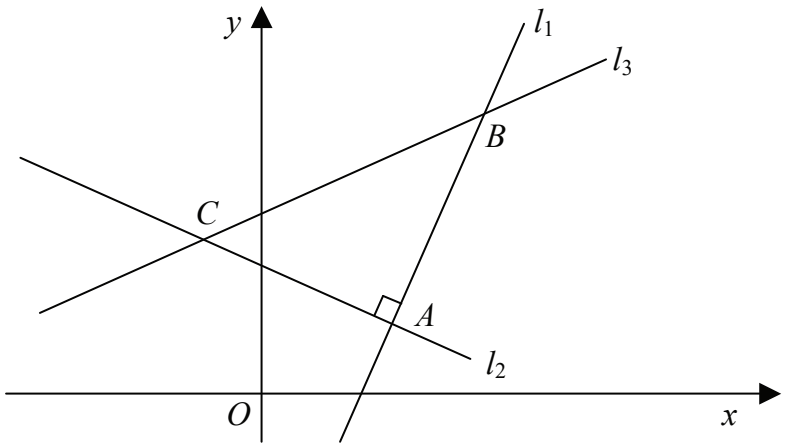
   (c) By forming an appropriate inequality, or otherwise, find how many terms of the series are positive. [3]

   (d) Hence find the maximum value of S_n, the sum of the first n terms of the series. [3]

Total: 12



8. Figure shows the lines l_1, l_2 and l_3.



Line l_1 passes through the points $A(5, 2)$ and $B(7, 8)$.

(a) Find an equation of the line l_1. [3]

Line l_2 is perpendicular to line l_1 and also passes through the point A.

(b) Find an equation of the line l_2. [3]

Line l_3 has equation $x - 2y + 9 = 0$ and intersects line l_1 at B and line l_2 at the point C.

(c) Find the coordinates of the point C. [4]

(d) Prove that triangle ABC is isosceles. [4]

Total: 14